

# HOW THE SHORTAGE OF STEM TALENT INFLUENCES 21<sup>ST</sup> CENTURY WORKFORCE DEMANDS

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Committee on Education  
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## The Problem is Multi-faceted

- The U.S. educational system is not keeping pace with the development of these future technologists
- The global economy is changing and demand for STEM educated talent is increasing at a rapid pace
- STEM talent is now required by nearly all industries in an increasingly larger pool of developing nations as technology becomes the primary driver in competition
- While there is general agreement about the problem, the solution paths are not clear and not integrated

## The Problem is Multi-faceted

- The demand side issue
- The economics of the problem
- The curriculum itself
- The perceptual problem
- The scope of STEM programs (opt-in vs. curriculum based learning)
- Legislative/Immigration issues
- Integrating best practice

## Demand: What Companies are Facing

Brookings Institution Study released July 1, 2014<sup>1</sup>

- Job openings for STEM positions take longer to fill than openings in other fields.
- Specific high-value skills requested by employers and common to STEM occupations are particularly scarce relative to demand and yet particularly valuable to employers.
- The regional supply of workers in a given occupation affects the length of vacancy advertisements.

**The shortage in STEM talent is exacerbated by the combination of an aging and retiring workforce and an uptick in the economy.**

<sup>1</sup><http://www.brookings.edu/research/interactives/2014/job-vacancies-and-stem-skills#/M10420>

## Economics: The Vortex that Companies Face

Companies are investing more to recruit and retain talent but finding it increasingly difficult to retain them

- Reaching out further than ever before
- Increased legal expenses (VISAs, complicated compliance) and time-to-hire
- Poaching is becoming a bigger problem
- Client relationships are strained
- Cost basis keeps increasing, straining profitability
- Unnatural "sellers market"
- Higher costs induce a need for higher efficiency which causes "engagement strain" → attrition



Developed market countries that rely heavily on high-skill foreign STEM talent – the US awards more than 50 percent of engineering and computer science doctorates to foreign students—may find it more difficult to attract the world's best and brightest STEM talent as economic growth in developing economies inspires entrepreneurship and creates new professional opportunities<sup>2</sup>

<sup>2</sup>Accenture, *Where Will All the STEM Talent Come From?* (May, 2012)

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## Curriculum/Perception: Framing the Problem

- At the elementary school level, teachers do not have time/skills to teach STEM → needs to be integrated
- Successful programs seek out children that don't yet know they are interested in STEM
- Perceptual problem kicks in early and definitely by middle-school (It's not "cool" to be an engineer)
- Students that have not mastered the basics at the elementary level cannot succeed at the secondary level. Programs like No Child Left Behind are a real problem at this level.
- Incoming college freshmen are largely unprepared for the rigors of a collegiate level STEM education.

**Businesses, governments and educational institutions must devise long-term strategies to boost the PhD pipeline and find short-term solutions for bridging this gap between talent demand and supply.**

– Accenture, *Where Will All the STEM Talent Come From?* (May, 2012)

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## Curriculum/Perception: Framing the Problem

### Elementary and Middle School

- At the elementary school level, teachers do not have time/resources to teach STEM → needs to be an integrated, curriculum-based approach with hands-on experiential opportunities.
- Successful programs provide resources, volunteers and seek out children who don't yet know they are interested in STEM ("opt-in" is not the preferred approach)
- Perceptual problem kicks in early and definitely by middle-school (It's not "cool" to be an engineer)

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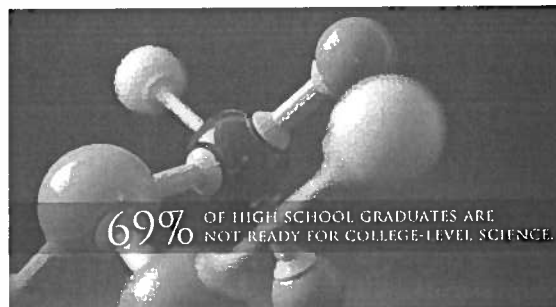
## Curriculum/Perception: Framing the Problem

### Secondary (High School)

- Students that have not mastered the basics at the elementary level cannot succeed at the secondary level. Programs like No Child Left Behind become a real problem at this level.

### University Level

- Incoming college freshmen are largely unprepared for the rigors of a collegiate level STEM education.



National Math + Science Initiative.  
January 13, 2014

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## Legislation/Economics: What Must We Do?

- Find ways to overcome the perceptual issue with STEM job fields that exists with talented young students
- Education reform – a concentration on learning by having fun and using technology in a productive and experiential way
- Incentivize STEM success in fields that suffer from acute shortages
- Immigration reform – the “short-term” solution or “easing”
- Consider tax credits for companies involved in STEM philanthropy, rather than deductions from income
- Coordinate activities to grow and retain STEM talent (a thousand points of light doesn't work)
- Create a truly national framework for STEM education

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## Best Practice: SAE Foundation Programs Creating a Pipeline from K to College

K-8	9-12	COLLEGE
<b>A World in Motion®</b> <ul style="list-style-type: none"> <li>• Age appropriate activities combine a comprehensive curriculum, built around the Engineering Design Experience</li> <li>• Benchmarked to national math and science standards</li> <li>• Cost effective way to make an impact locally, regionally, and nationally</li> </ul>	<b>F1 in Schools™</b> <ul style="list-style-type: none"> <li>• CAD/CAM technology based design challenge</li> <li>• Students design, analyze, manufacture, and test miniature F1 race cars</li> <li>• Delivered in classroom and after school settings</li> <li>• Students create design portfolios and poster presentations</li> </ul>	<b>Collegiate Design Series™</b> <ul style="list-style-type: none"> <li>• Diverse series of projects representing and showcasing aerospace, automotive, and off-highway design</li> <li>• Students from all class levels and academic majors form integrated, multidisciplinary teams</li> <li>• Students gain real world project management and manufacturing experience</li> </ul>
<ul style="list-style-type: none"> <li>• Primary activities integrate STEM with language arts</li> <li>• Designed to reach ALL students to increase scientific literacy through project-based learning</li> <li>• Professional development and training improves teachers' effectiveness</li> <li>• Engages employees as STEM volunteers in the classroom</li> <li>• Flexible program model for delivery in and out of the classroom</li> </ul>	<ul style="list-style-type: none"> <li>• Students compete regionally to qualify for the US Nationals Competition</li> <li>• US Nationals held in conjunction with Formula SAE at Michigan International Speedway</li> <li>• Winning US team travels to F1 in Schools World Championship - the world's largest STEM competition</li> <li>• Teams secure sponsors, prepare business plans, manage budgets, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• All top 50 U.S. engineering degree producing schools, as rated by the ASCE (American Society of Engineering Education) participate in at least one CDS event</li> <li>• CDS events provide sponsoring companies direct access to brightest engineering talent</li> <li>• SAE's Collegiate Design Series programs satisfy accreditation criteria for design in university engineering curriculum</li> </ul>



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## FEV's Recruiting Experience



- FEV prefers to recruit locally (Michigan)
- Established internship programs with local universities (MSU, UofM, Kettering, Oakland, Michigan Tech, etc.)
- International internships (RWTH Aachen, others)
- Recruit directly out of Formula SAE (CDS) teams because they have both theoretical knowledge and hands-on, practical skills
- College recruiting fairs (less efficient, higher cost). Use to reach our regionally.
- Experienced engineers need to frequently be brought in from out-of-state at significant expense to FEV (we spend over 250,000 dollars each year on international relocations and legal fees associated with visas & immigration – for a 400 person engineering services company)